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BRE Global Classification Report

Kingspan Insulation Limited Classification of fire performance in accordance with BR 135: 2013 Annex B

Prepared for: Kingspan Insulation Limited

Date: 14th August 2018

Report Number: P109938-1001 Issue: 1

BRE Global Ltd
Watford, Herts
WD25 9XX

Customer Services 0333 321 8811

From outside the UK:
T + 44 (0) 1923 664000
F + 44 (0) 1923 664010
E enquiries@bre.co.uk
www.bre.co.uk

Prepared for:
Kingspan Insulation Limited
Pembridge,
Leominster,
Herefordshire,
HR6 9LA,
UK

Prepared by

Name Mohamed Abukar

Position Test Engineer

Signature 

Authorised by

Name Stephen Howard

Position Director Fire Testing and Certification

Date 14th August 2018

Signature 

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CLASSIFICATION OF FIRE PERFORMANCE IN ACCORDANCE WITH BR 135:2013 Annex B

Sponsor: Kingspan Insulation Limited, Pembridge, Leominster, Herefordshire, HR6 9LA, UK

Prepared by: BRE Global Ltd, BRE, Bucknalls Lane, Garston, Watford, WD25 9XX, England

Product name: Alpolic A2 ACM panels with 100mm-thick Kingspan Kooltherm insulation

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This classification report consists of 21 pages and may only be used or reproduced in its entirety.

1 Introduction

This report presents the classification of the system detailed in section 2. The classification is carried out in accordance with the procedures given in BR 135 – 'Fire performance of external thermal insulation for walls of multi-storey buildings', Third edition, Annex B 2013. This classification should be read in conjunction with this document and the associated test reports referenced in section 4.

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2 Details of the Classified Product

2.1 Description of substrate

The product was installed on to wall number 3 of the BRE Global test facility. This apparatus is representative of a structural steel framed building and consists of a structural steel test frame with a vertical main test wall and a vertical return wall at a 90º angle to and at one side of the main test wall. The main wall includes the combustion chamber.

2.2 Description of product

Table 1. List of component parts used in the construction of the system

Item	Description
1	Kingframe SFS (steel framing system) comprising galvanised, cold formed steel 'C' & 'U'-sections with 100×50mm studs.
2	12.5mm-thick plasterboard (double layer, fitted to internal face of partition).
3	12mm-thick Versapanel cement particle board.
4	Galvanised steel 'U'-shaped channels (170mm-wide×20mm-deep×2mm-thick).
5	Aluminium 'L'-shaped brackets (85mm-deep×50mm-wide×120mm-high×5mm-thick).
6	Galvanised steel folded skewers (320mm-long×25mm-wide).
7	Siderise Lamatherm RV-90/30 stone wool vertical cavity barriers (75mm-thick×160mm-deep).
8	Galvanised steel folded skewers (350mm-long×25mm-wide).
9	Siderise Lamatherm RH25G-90/30 stone wool horizontal cavity barriers with intumescent strip (75mm-thick×125mm-deep).
10	100mm-thick Kingspan Kooltherm K15 insulation.
11	Aluminium 'T'-shaped rails (120mm-wide×60mm-deep×2mm-thick).
12	Aluminium 'L'-shaped rails (40mm-wide×60mm-deep×2mm-thick).

13	Aluminium 'L'-shaped angles (175mm×70mm×5mm-thick).
14	4mm-thick Alpolic A2 ACM panels (Booth Muirie BML400 rivet fixed).

2.3 Installation sequence

A lightweight steel framework partition was constructed from 100mm×55mm 'C'-section Kingframe SFS studwork. The horizontal sections were fixed into the 'floor slabs' and the ground using 5.5×40mm self-drilling screws. The vertical sections were fixed to the horizontal sections at 465-600mm centres on the main wall and 265-600mm centres on the wing wall using 5.5×25mm self-drilling screws.

A double layer of 12.5mm-thick plasterboard was fitted with long edge horizontal to the internal face of the partition using 3.5×38mm drywall screws at 265-600mm horizontal and 390mm vertical centres. Versaseal-FS Euroform Grey sealant was applied between adjacent boards.

A single layer of 12mm-thick cement board was fixed with long edge vertical to the external face of the partition using 3.5×38mm drywall screws at 265-600mm horizontal and 390mm vertical centres. Versaseal-FS Euroform Grey sealant was applied between adjacent boards.

'U'-shaped channels (170mm-wide×20mm-deep×2mm-thick) were fitted horizontally to the external face of the cement board at 420-960mm vertical centres. The channels were fixed using 5.5×45mm self-drilling screws at 600mm horizontal and 145mm vertical centres.

'L'-shaped brackets (85mm-deep×50mm-wide×120mm-high×5mm-thick) were fixed to the 'U'-shaped channels at 485mm horizontal centres using two 5.5×45mm self-drilling screws per bracket.

Galvanised steel folded skewers (320mm-long×25mm-wide) were fixed to the cement board at nominal 600mm vertical centres in three columns located either side of the combustion chamber opening (approximately 280mm and 2280mm from the main-wing wall junction) and one at the outside edge of the wing wall (approximately 1150mm from the main-wing wall junction).

Siderise Lamatherm RV-90/30 stone wool vertical cavity barriers (75mm-thick×160mm-deep) were pressed onto the skewers in columns. On the wing wall each vertical column was interrupted by the horizontal cavity barriers.

Galvanised steel folded skewers (350mm-long×25mm-wide) were fixed to the cement board at 300-450mm horizontal centres in four rows located: 0mm, 2400mm, 4800mm and 6600mm above the top of the combustion chamber.

Siderise Lamatherm RH25G-90/30 stone wool horizontal cavity barriers with intumescent strip (75mm-thick×125mm-deep) were pressed onto the skewers in rows. A cut was made along the length of the skewers local to the tip and the ends were folded to opposite sides to secure the intumescent cavity barriers in place. On the main wall each horizontal row was interrupted by the vertical cavity barriers which extended the full height.

100mm-thick Kingspan Kooltherm K15 insulation was fitted to the cement board using 6.1×125mm screws with 70mm insulation retaining discs and 5.5×150mm screws with 70mm insulation retaining discs alternating at 600mm horizontal and 770mm vertical centres. The discs were sealed with silver tape.

120mm-wide×60mm-deep×2mm-thick 'T'-shaped rails were fixed to the 'L'-brackets in columns located: at the outer edges of the combustion chamber and in line with the vertical centreline of the combustion chamber on the main wall (from the top of the combustion chamber up to the full height of the cladding system) and at the main-wing wall junction on the wing wall. The rails were fixed using 5.5×55mm self-drilling screws.

40mm-wide×60mm-deep×2mm-thick 'L'-shaped rails were fixed to the remaining 'L' brackets using 5.5×55mm self-drilling screws.

B1 foam was used to seal the gaps around the 'L'-brackets in the Kingspan Kooltherm insulation and silver tape was applied over the B1 foam.

4mm-thick Alpolic A2 ACM panels were fitted to the rails using 4.8×16mm Booth Muirie BML400 rivets at 640mm horizontal, 320mm vertical centres on the wing wall and 110-460mm horizontal, 380mm vertical centres on the main wall.

There was a cavity of 50mm between the front face of the insulation and the rear face of the ACM panels.

The panels at the outer edge of the main wall returned around the edges where they were fixed using a single column of rivets at 380mm vertical centers.

There was a gap of 20mm between adjacent ACM panels.

175mm×70mm×5mm 'L'-shaped angles were fitted to the combustion chamber surround to form a window pod using 5.5×55mm at 480mm vertical centres for the angles fixed to the sides of the combustion chamber opening and 580mm horizontal centers for the angle fixed to the top of the combustion chamber opening.

2.4 Installation of specimen

All test materials were supplied and installed by the Test Sponsor. BRE Global were not involved in the sample selection process and therefore cannot comment upon the relationship between samples supplied for test and the product supplied to market.

3 Product Specification

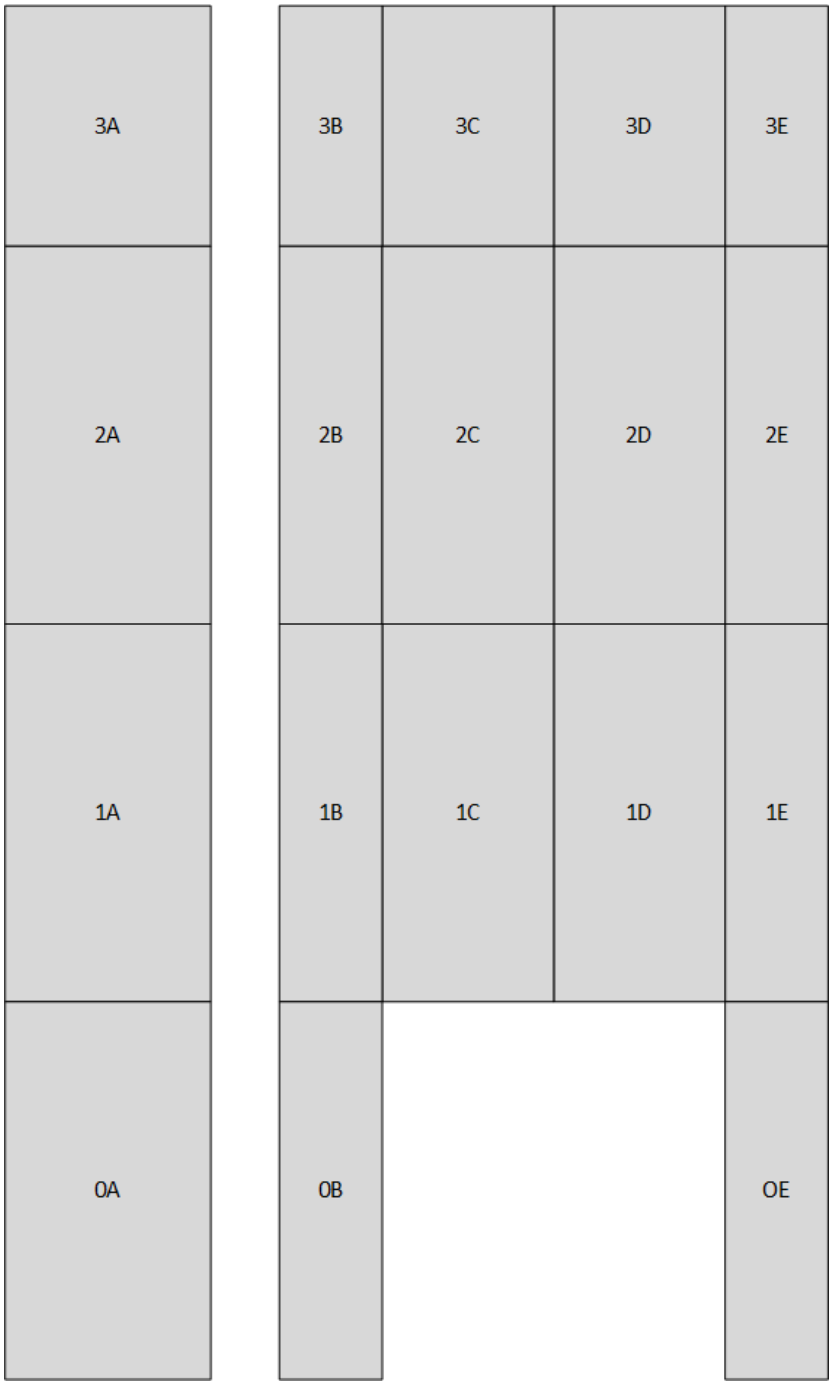

Figure 1. Layout of panels and numbering system used for reporting. Not to scale.

Figure 2. Full-height photograph of cladding system prior to test.

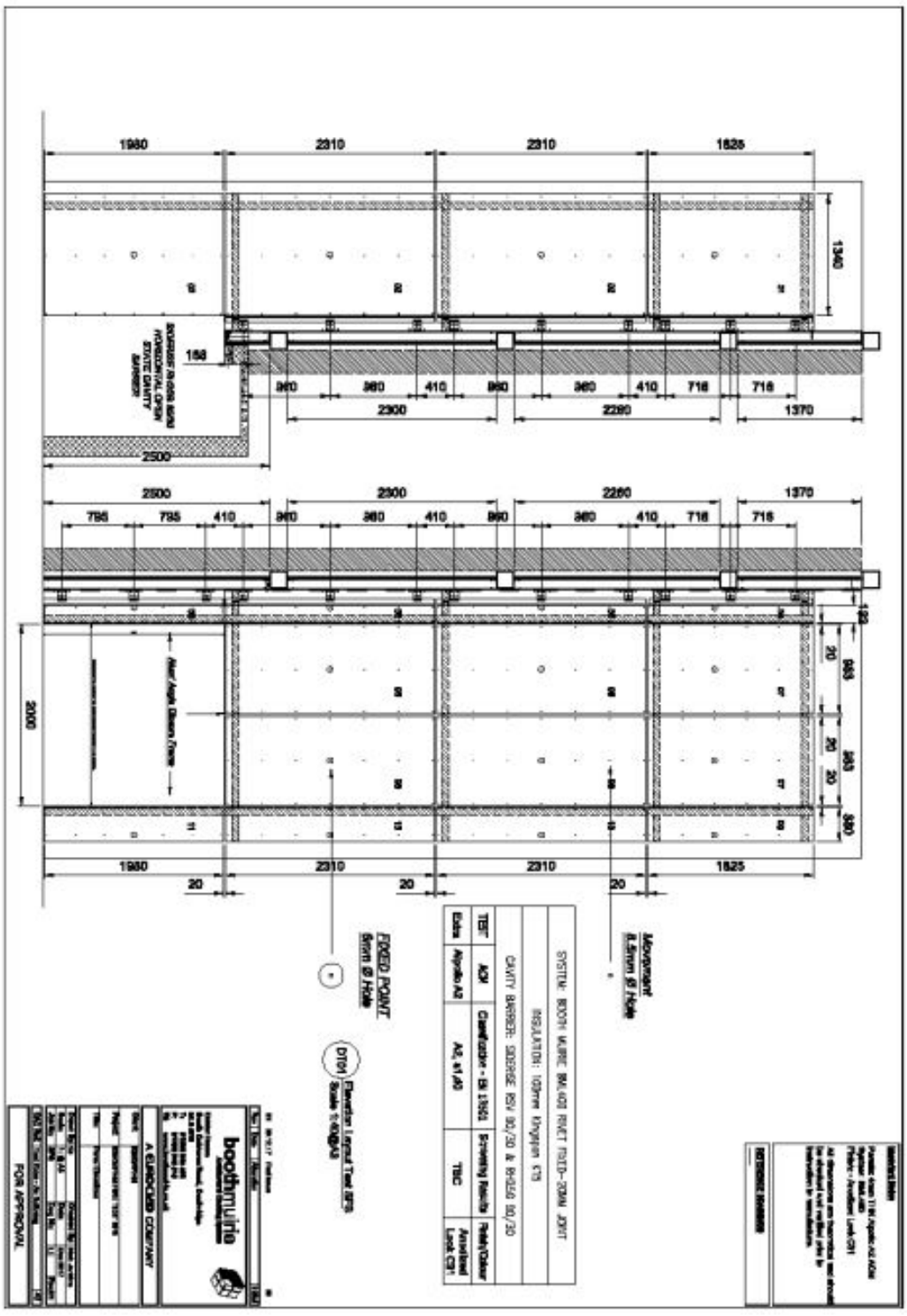

Figure 10. ACM panel dimensions (supplied by Test Sponsor).

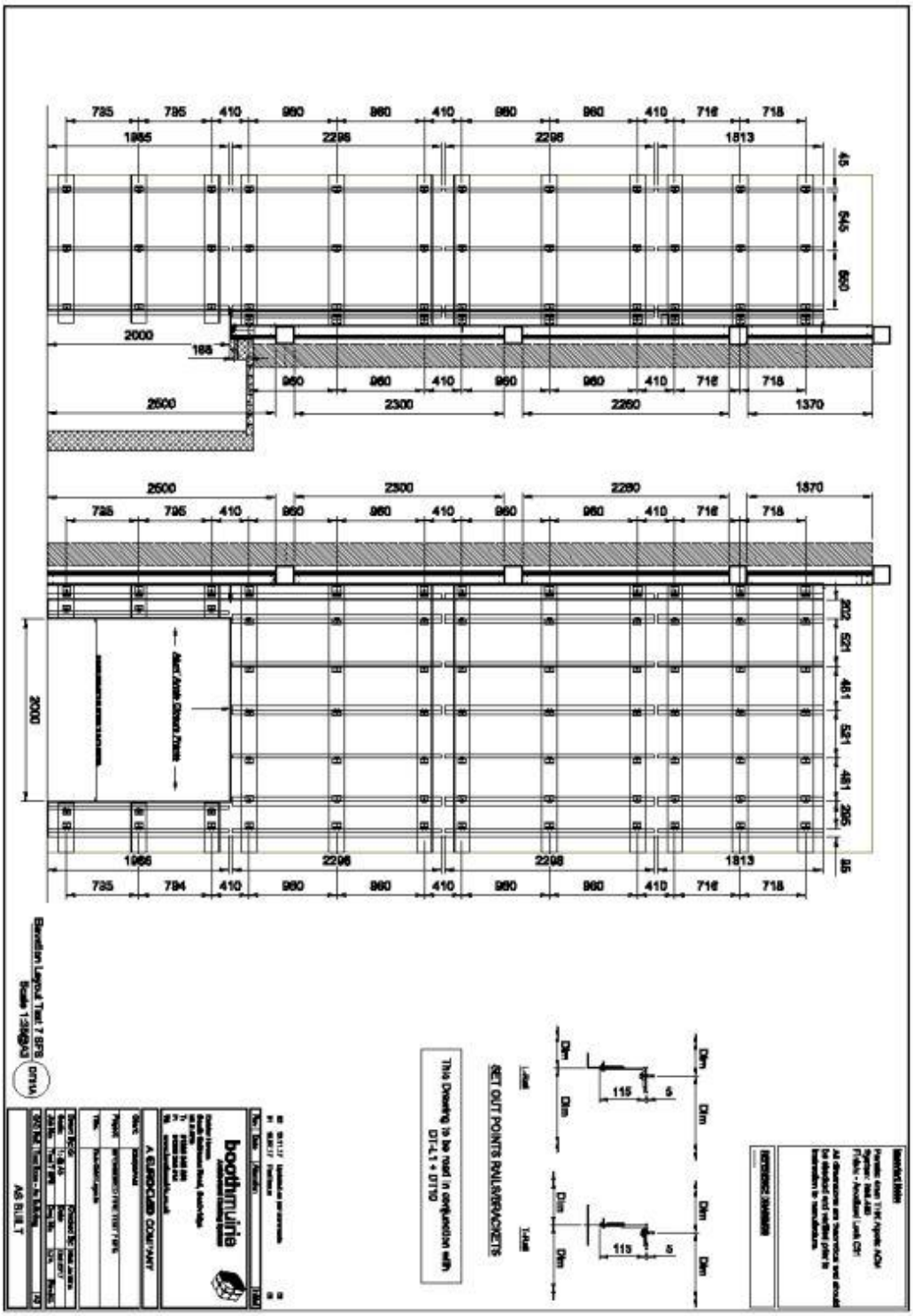

Figure 11. Rail and ‘L’-shaped bracket locations (supplied by Test Sponsor).

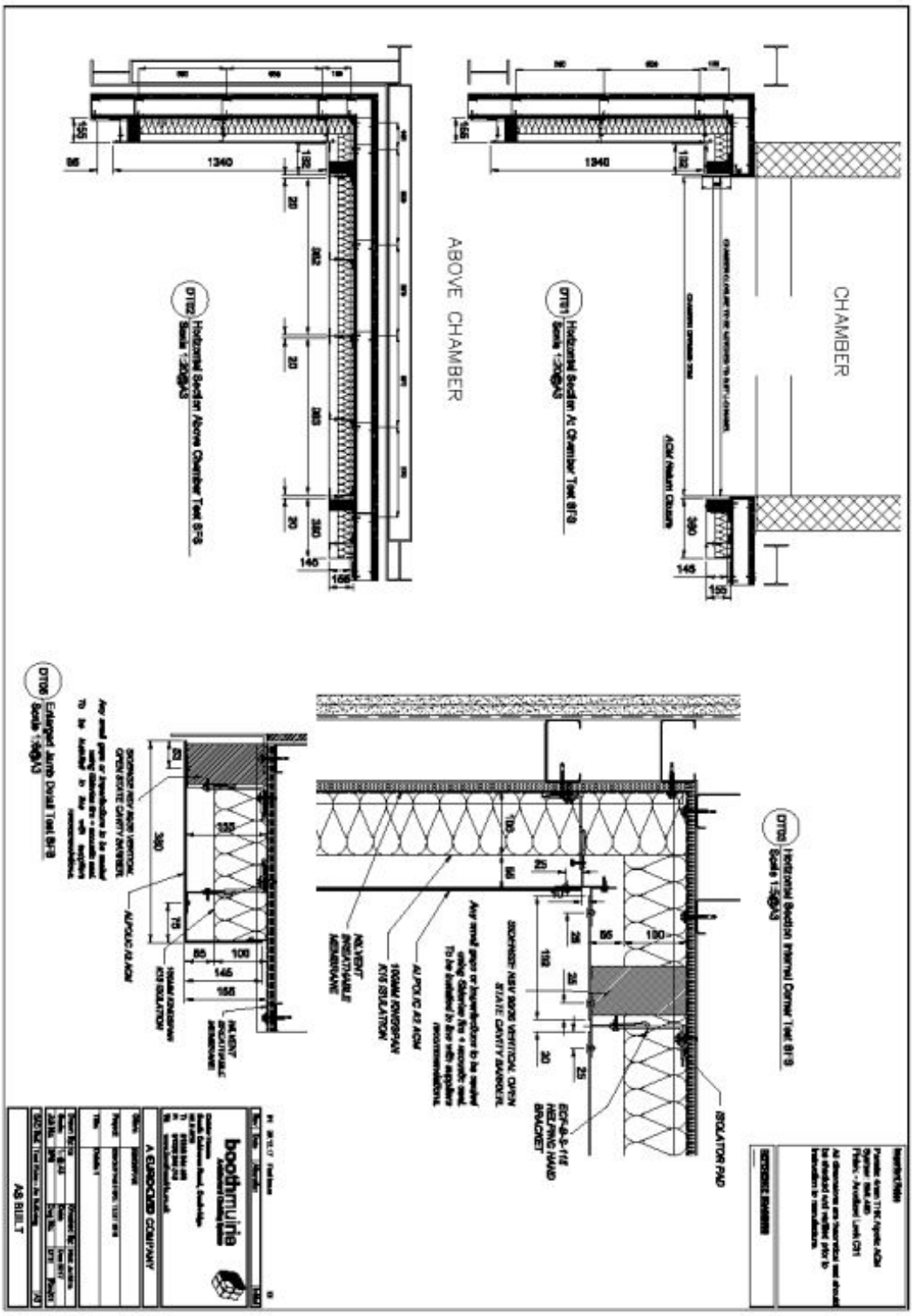

Figure 12. Cross-section views of cladding system (supplied by Test Sponsor).

4 Supporting Evidence

4.1 Test reports

Name of Laboratory	Name of sponsor	Test reports/extended application report Nos.	Test method / extended application rules & date
BRE Global, BRE	Kingspan Insulation Limited	P109938-1000 Issue 2	BS 8414-2:2015 + A1:2017

4.2 Test results

Test method	**Parameter**	**No. tests**	**Results**	
			Fire spread test result time, t_s (min)	**Compliance with parameters in Annex B BR135:2013**
BS 8414-2:2015 + A1:2017	External fire spread	1	>15 minutes	Compliant
	Internal fire spread		>15 minutes	Compliant
	System burn through		>15 minutes	Compliant

4.3 Mechanical performance

Flaming debris was observed from the cladding system from 12 minutes 5 seconds until approximately 19 minutes 25 seconds. A small fire formed at the base of the cladding system as a result. Consumption of ACM panels was observed tapering up to a height of approximately 5m above the top of the combustion chamber. Detachment of insulation and horizontal cavity barriers was also observed.

After the crib was extinguished flaming continued within the exposed insulation until approximately 35 minutes 10 seconds where the flaming was concentrated behind the remainder of panels 1C, 1D, 2C and 2D. All flaming ceased at 50 minutes 40 seconds.

4.4 System damage

4.4.1 ACM panels

With reference to *Figure 1* the damage to the ACM panels was as follows:

Panel 0A – 70% of coating removed and 20% dark discolouration and panel distorted.
Panel 0B – Intact and in place with distortion across panel.
Panel 0E – dark discoloration at top left-hand corner, no visible damage across the rest of the panel.

Panel 1A – 70% coating removed and 20% dark discolouration, panel distorted.
Panel 1B – 90% dark discolouration with distortion.
Panel 1C – 80% consumed. 80% of coating removed and 20% dark discolouration on the remainder of the panel.
Panel 1D – 80% consumed. 60% of coating removed and 30% dark discolouration on the remainder of the panel.
Panel 1E – localised areas of dark discolouration with minor distortion across the panel.

Panel 2A – 30% dark discolouration with distortion across the panel.
Panel 2B – dark discolouration at bottom left-hand corner. Distortion across panel.
Panel 2C – 40% consumed. 60% of coating removed and 20% dark discolouration on the remainder of the panel.
Panel 2D – 40% consumed. 40% coating removed and 20% dark discolouration on the remainder of the panel.
Panel 2E – dark discolouration at bottom left-hand corner. Minor distortion across panel.

Panel 3A – intact and in place. Slight distortion.
Panel 3B – intact and in place. Slight distortion.
Panel 3C – slight consumption at base of panel (<0.01m^2). 30% dark discolouration and 10% of coating removed.
Panel 3D – 20% dark discolouration with 10% of coating removed. Heavy distortion at base with slight distortion throughout panel.
Panel 3E – no visible damage.

Combustion chamber surround

The left-hand side of the combustion chamber surround was distorted and discoloured from the top to approximately 1800mm above the floor.
The top of the combustion chamber surround was 90% consumed.
The right-hand side of the combustion chamber surround had 5% consumption towards the top with dark discolouration.

4.4.2 Aluminium rail substructure

Main wall

Between the ground and top of the combustion chamber opening

There was no visible damage.

Between the top of the combustion chamber and third row of horizontal cavity barriers

The first vertical rail from the edge of the main wall had slight distortion.

The second vertical rail from the outer edge of the main wall had localised areas of dark and pale discolouration with heavy distortion along the rail.

The third, fourth and fifth rails from the outer edge of the main wall were fully consumed.

The sixth vertical rail from the outer edge of the main wall had localised areas of dark and pale discolouration with heavy distortion along the length.

Between the third and fourth row of horizontal cavity barriers

The first rail from the outer edge of the main wall had slight distortion.

The second rail from the outer edge of the main wall had localised areas of dark and pale discolouration with heavy distortion along the rail.

The third, fourth and fifth rails from the outer edge of the main wall had 90% dark discolouration with localised areas of pale and smoke discolouration.

The sixth rail from the outer edge of the main wall had localised areas of smoke discolouration.

Wing Wall

Between the ground and top of the combustion chamber opening

There was no visible damage.

Between the top of the combustion chamber and third row of horizontal cavity barriers

The first rail from the inner edge of the wing wall had localised areas of dark discolouration.

The second rail from the inner edge of the wing wall had localised areas of smoke discolouration.

The third rail from the inner edge of the wing wall had no visible damage.

Between the third and fourth row of horizontal cavity barriers

There was no visible damage.

4.4.3 Insulation

Main wall

Between the ground and first row of horizontal cavity barriers

There was no visible damage.

Between the first and second row of horizontal cavity barriers

Between the outer edge of the main wall and the vertical cavity barrier located adjacent to the outer edge of the main wall there was no visible damage.

Between the vertical cavity barrier located adjacent to the outer edge of the main wall and the vertical cavity barrier located adjacent to the main-wing wall junction there was 95% detachment of insulation exposing the cement board layer. The remaining insulation was charred.

Between the vertical cavity barrier located adjacent to the main-wing wall junction and the main-wing wall junction there was no visible damage.

Between the second and third row of horizontal cavity barriers

Between the outer edge of the main wall and the vertical cavity barrier located adjacent to the outer edge of the main wall there was no visible damage.

Between the vertical cavity barrier located adjacent to the outer edge of the main wall and the vertical cavity barrier located adjacent to the main-wing wall junction there was 80% detachment of insulation exposing the cement board layer. The remaining insulation was charred.

Between the vertical cavity barrier located adjacent to the main-wing wall junction and the main-wing wall junction there was no visible damage.

Between the third and fourth row of horizontal cavity barriers

Between the outer edge of the main wall and the vertical cavity barrier located adjacent to the outer edge of the main wall there was no visible damage.

Between the vertical cavity barrier located adjacent to the outer edge of the main wall and the vertical cavity barrier located adjacent to the main-wing wall junction there was 50% dark discolouration, 20% pale discolouration and 30% smoke discolouration.

Between the vertical cavity barrier located adjacent to the main-wing wall junction and the main-wing wall junction there was no visible damage.

Wing wall

There was no visible damage to the insulation on the wing wall throughout the height of the cladding system.

4.4.4 Vertical cavity barriers

The vertical barrier located at the outer edge of the main wall had localised areas of dark and pale discolouration between the top of the combustion chamber and the third row of horizontal cavity barriers. The rest of the barrier had no visible damage.

The vertical cavity barrier located adjacent to the main-wing wall junction had localised areas of dark and pale discolouration from the top of the combustion chamber to the top of the cladding system. The rest of the barrier had no visible damage.

The vertical cavity barrier at the outer edge of the wing wall had no visible damage.

4.4.5 Horizontal (intumescent) cavity barriers

First row of horizontal cavity barriers

Main wall

Between the outer edge of the main wall and the vertical cavity barrier located adjacent to the outer edge of the main wall there was no activation of the intumescent strip.

Between the vertical cavity barrier located adjacent to the outer edge of the main wall and the vertical cavity barrier adjacent to the main-wing wall junction there was 90% detachment of the cavity barrier. The remainder of the barrier had dark discolouration.

Between the vertical cavity barrier adjacent to the main-wing wall junction and the main-wing wall junction there was partial activation of the intumescent strip.

Wing wall

Between the main-wing wall junction and the vertical cavity barrier adjacent to the outer edge of the wing wall there was full activation of the intumescent strip.

Between the vertical cavity barrier adjacent to the outer edge of the wing wall and the edge of the wing wall there was no activation of the intumescent strip.

Second row of horizontal cavity barriers

Main wall

Between the outer edge of the main wall and the vertical cavity barrier located adjacent to the outer edge of the main wall there was no activation of the intumescent strip.

Between the vertical cavity barrier located adjacent to the outer edge of the main wall and the vertical cavity barrier adjacent to the main-wing wall junction there was full activation of the intumescent strip with partial detachment of the barrier.

Between the vertical cavity barrier adjacent to the main-wing wall junction and the main-wing wall junction there was partial activation of the intumescent strip.

Wing wall

Between the main-wing wall junction and the outer edge of the wing wall there was full activation of the intumescent strip.

Third row of horizontal cavity barriers

Main wall

Between the outer edge of the main wall and the vertical cavity barrier located adjacent to the outer edge of the main wall there was no activation of the intumescent strip.

Between the vertical cavity barrier located adjacent to the outer edge of the main wall and the main-wing wall junction there was full activation of the intumescent strip.

Wing wall

Between the main-wing wall junction and the outer edge of the wing wall there was partial activation of the intumescent strip.

Fourth row of horizontal cavity barriers

Main wall

Between the outer edge of the main wall and the vertical cavity barrier located adjacent to the outer edge of the main wall there was no activation of the intumescent strip.

Between the vertical cavity barrier located adjacent to the outer edge of the main wall and the main-wing wall junction there was partial activation of the intumescent strip.

Wing wall

Between the main-wing wall junction and the outer edge of the wing wall there was partial activation of the intumescent strip.

4.4.6 'U'-shaped channels

On the main wall the first to the fifth 'U'-shaped channel from the top of the combustion chamber had dark discolouration between the vertical cavity barriers on the main wall. The rest of the channels had no visible damage.

4.4.7 'L'-shaped brackets

The 'L'-shaped brackets on the main wall between the vertical cavity barriers had heavy distortion with partial consumption of the brackets within the flame damage zone. The rest of the brackets had no visible damage.

4.4.8 Cement particle board

On the main wall there were areas of dark and pale discolouration where the insulation and cavity barriers had detached. The area of discolouration extended from the top of the combustion chamber up to a height of the approximately 200mm above the top of the third row of horizontal cavity barriers and was mostly contained between the vertical cavity barriers on the main wall. There were areas of dark discolouration at the edges immediately surrounding the combustion chamber opening.

On the wing wall there was an area of dark discolouration approximately 250mm-wide×50mm-high at a height of approximately 2300mm above the top of the combustion chamber.

4.4.9 Partition

There was no visible damage.

4.4.10 Plasterboard

There was no visible damage.

5 Classification and Field of Application

5.1 Reference of classification

This classification has been carried out in accordance with Annex B of BR 135 – 'Fire performance of external thermal insulation for walls of multi-storey buildings.' Third Edition 2013.

5.2 Classification

The system described in this classification report has been tested and met the performance criteria set in Annex B of BR 135:2013.

5.3 Field of application

This classification is valid only for the system as installed and detailed in Section 2 of this classification report and the associated details found in the related test reports, referenced in Section 4.

6 Limitations

This classification document does not represent type approval or certification of the product.

The classification applies only to the system as tested and detailed in the classification report. The classification report can only cover the details of the system as tested. It cannot state what is not covered. When specifying or checking a system it is important to check that the classification documents cover the end-use application.

The specification and interpretation of fire test methods are the subject of ongoing development and refinement. Changes in associated legislation may also occur. For these reasons, it is recommended that the relevance of test and classification reports over five years old should be considered by the user. The laboratory that issued the report will be able to offer, on behalf of the legal owner, a review of the procedures adopted for a particular test or classification to ensure that they are consistent with current practices, and if required may endorse the report.

Report Ends